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DATA SHEET

BFG11W/X
NPN 2 GHz power transistor

Product specification
Supersedes data of September 1995
File under Discrete Semiconductors, SC14

1996 Jun 04

Philips
Semiconductors

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NPN 2 GHz power transistor BFG11W/X

FEATURES

- High power gain
- High efficiency
- Small size discrete power amplifier
- 1.9 GHz operating area
- Gold metallization ensures excellent reliability
- Linear and non-linear operation.

APPLICATIONS

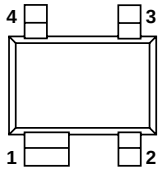
- Common emitter class-AB operation in handheld radio equipment at 1.9 GHz such as DECT, PHS.
- Driver for DCS 1800.

DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a plastic 4-pin dual-emitter SOT343 package.

PINNING - SOT343

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter



Top view MBK523

Marking code: S4

Fig.1 Simplified outline.

QUICK REFERENCE DATA

RF performance at $T_s \leq 60$ °C in a common-emitter test circuit.

MODE OF OPERATION	f (GHz)	V_{CE} (V)	P_L (mW)	G_p (dB)	η_c (%)
Pulsed, class-AB, $\delta < 1 : 2$; $t_p = 5$ ms	1.9	3.6	400	≥6	≥60

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	8	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	500	mA
P_{tot}	total power dissipation	up to T_s = 60 °C; note 1	–	760	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	175	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	up to T_s = 60 °C; P_{tot} = 760 mW; note 1	150	K/W

Note to the Limiting values and Thermal characteristics

1. T_s is the temperature at the soldering point of the collector tab.

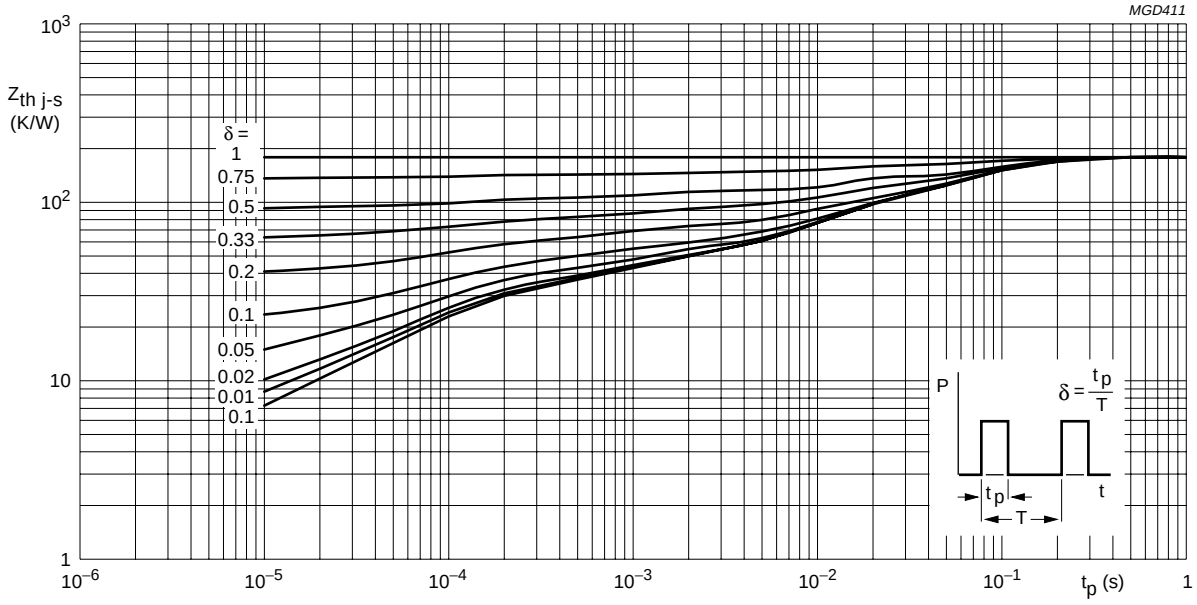


Fig.2 Transient thermal impedance from junction to soldering point as a function of pulse time; typical values.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 0.1 mA; open emitter	20	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 mA; open base	8	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 0.1 mA; open collector	2.5	–	V
I_{CES}	collector cut-off current	V_{CE} = 8 V; V_{BE} = 0	–	100	μA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 100 mA	25	–	
C_c	collector capacitance	V_{CB} = 3.6 V; $I_E = i_e$ = 0; f = 1 MHz	–	5	pF
C_{re}	feedback capacitance	V_{CE} = 3.6 V; I_C = 0; f = 1 MHz	–	4	pF

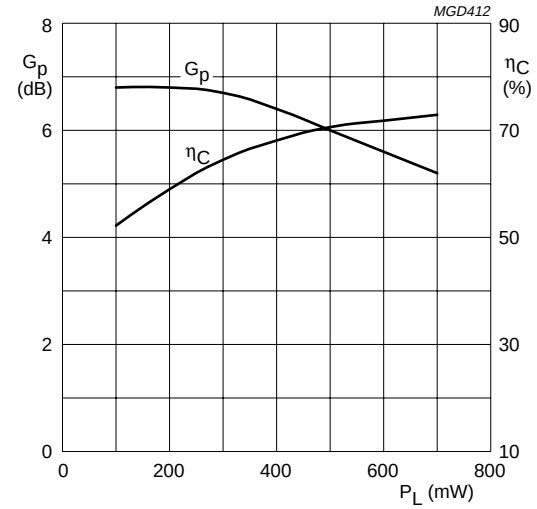
APPLICATION INFORMATION

RF performance at $T_s \leq$ 60 °C in a common-emitter test circuit.

MODE OF OPERATION	f (GHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (mW)	G_p (dB)	η_c (%)
Pulsed, class-AB, δ < 1 : 2; t_p = 5 ms	1.9	3.6	1	400	≥6	≥60

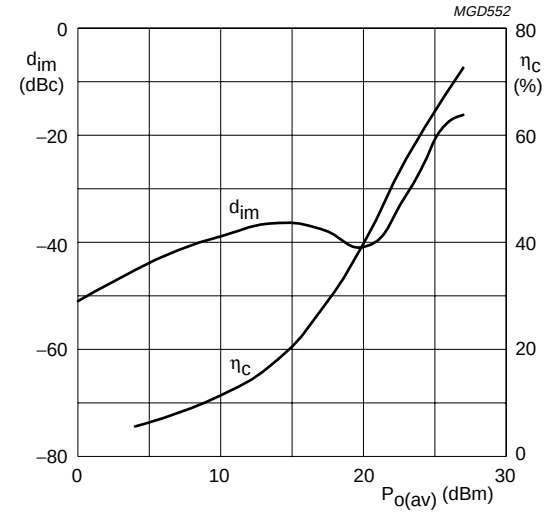
Ruggedness in class-AB operation

The transistors are capable of withstanding a load mismatch corresponding to VSWR = 8 : 1 through all phases, at rated output power under pulsed conditions at f = 1.9 GHz: t_p = 1.25 ms, δ = 1 : 8 at V_{CE} = 7 V and t_p = 5 ms, δ = 1 : 2 at V_{CE} = 4.5 V.



V_{CE} = 3.6 V; V_{BE} = 0.65 V; f = 1.9 GHz; δ < 1 : 8; t_p = 1.25 ms.

Fig.3 Power gain and efficiency as functions of load power; typical values.



V_{CE} = 3.6 V; $I_{c\varphi}$ = 1 mA; f_1 = 1990.0 MHz; f_2 = 1990.1 MHz; δ = 1 : 8; t_p = 625 μs.

Fig.4 Two tone intermodulation distortion and efficiency as functions of average output power; typical values.

List of components used in test circuit (see Figs 5 and 6)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE N0.
C1, C8, C9, C10	multilayer ceramic chip capacitor; note 1	24 pF		
C2, C3	multilayer ceramic chip capacitor; note 1	2 pF		
C4	multilayer ceramic chip capacitor; note 1	1.2 pF		
C5	multilayer ceramic chip capacitor; note 1	0.2 pF		
C6, C7,	multilayer ceramic chip capacitor; note 1	1.3 pF		
C11, C12, C13	multilayer ceramic chip capacitor; note 1	10 nF		
C14, C15	electrolytic capacitor	470 μF; 10 V		2222 032 14152
L1	stripline; note 2		length 22.5 mm width 0.9 mm	
L2	stripline; note 2		length 6 mm width 0.9 mm	
L3	stripline; note 2		length 1 mm width 0.9 mm	
L4	stripline; note 2		length 2.5 mm width 0.9 mm	
L5	stripline; note 2		length 4.5 mm width 0.9 mm	
L6	stripline; note 2		length 24.5 mm width 0.9 mm	
L7	stripline; note 2		length 20 mm width 0.9 mm	
L8	stripline; note 2		length 10.5 mm width 0.9 mm	
L9	stripline; note 2		length 4.4 mm width 0.4 mm	
L10	stripline; note 2		length 19.7 mm width 0.4 mm	
L11, L12	RF choke	1 μH		4330 030 36301
R1	metal film resistor	78.7 Ω; 0.4 W		
R2	metal film resistor	38.3 Ω; 0.4 W		
R3	metal film resistor	10 Ω; 0.4 W		
T1	bias transistor	BC548; note 3		

Notes

1. American Technical Ceramics (ATC) capacitor, type 100A or other capacitor of the same quality.
2. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric $\varepsilon_r = 6.15$; $\tan \delta = 0.0019$; thickness = 0.64 mm; copper cladding = 35 μm.
3. Or equivalent (V_{BE} = 0.65 V at T_{amb} = 25 °C).

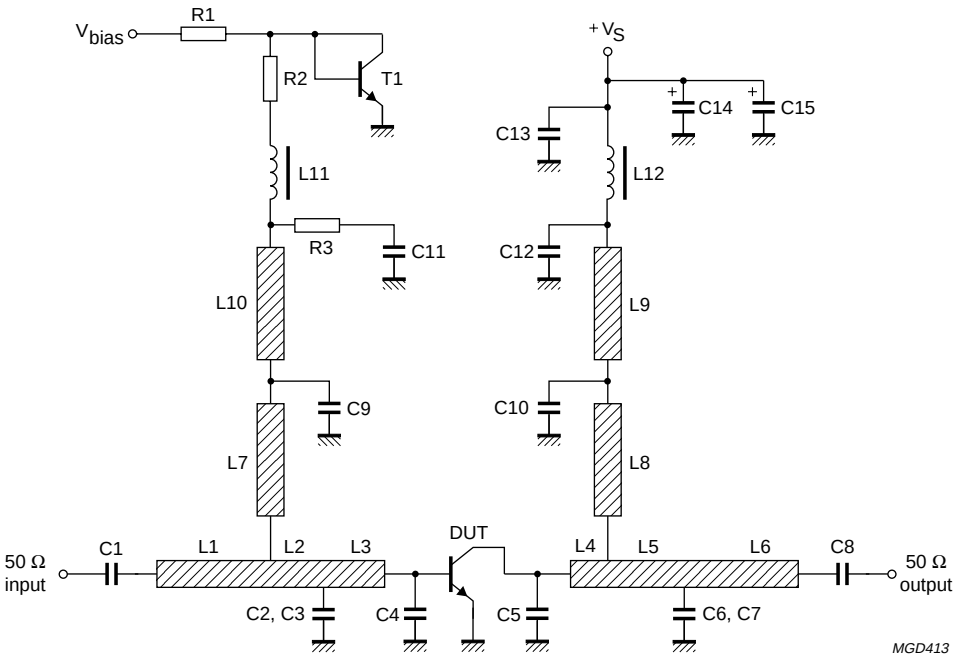
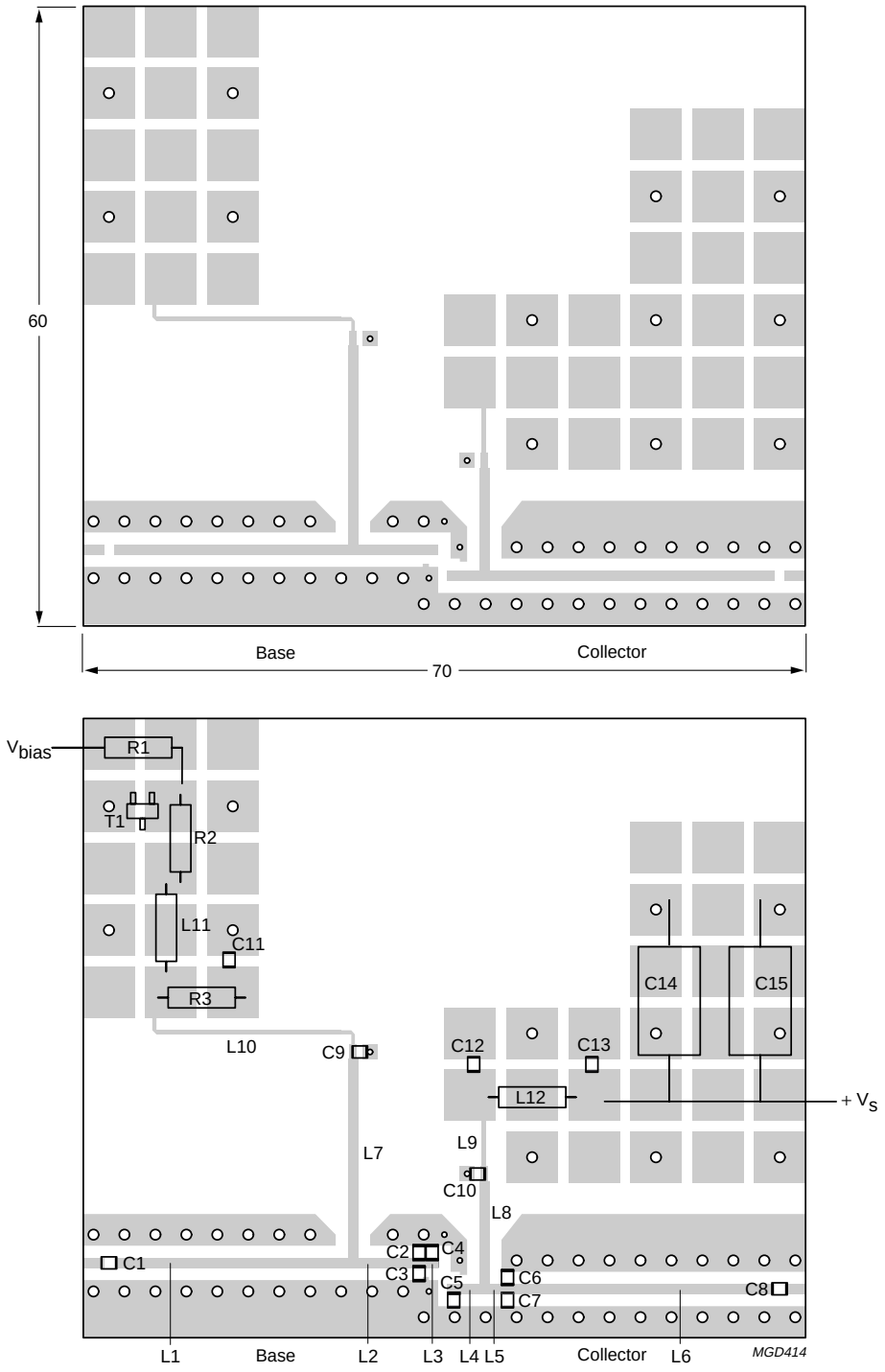
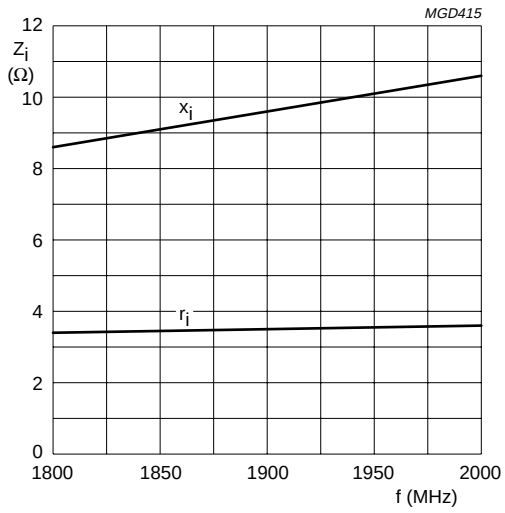


Fig.5 Common-emitter test circuit for class-AB operation at 1.9 GHz.



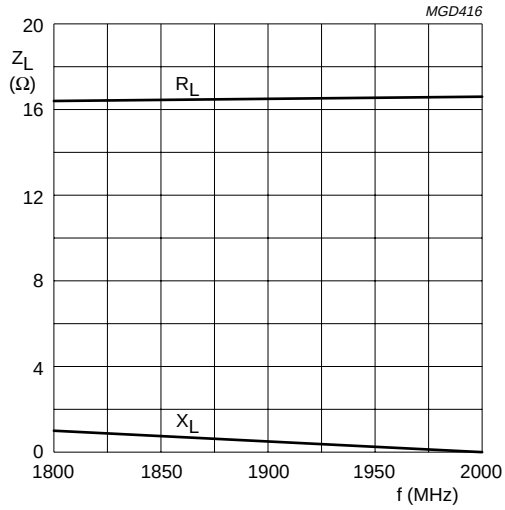
Dimensions in mm.

Fig.6 Component layout for common-emitter test circuit.



V_{CE} = 3.6 V; V_{BE} = 0.65 V; P_L = 400 mW.

Fig.7 Input impedance as a function of frequency (series components), typical values.



V_{CE} = 3.6 V; V_{BE} = 0.65 V; P_L = 400 mW.

Fig.8 Load impedance as a function of frequency (series components), typical values.

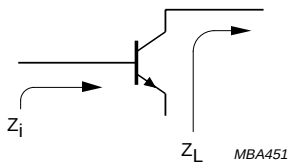
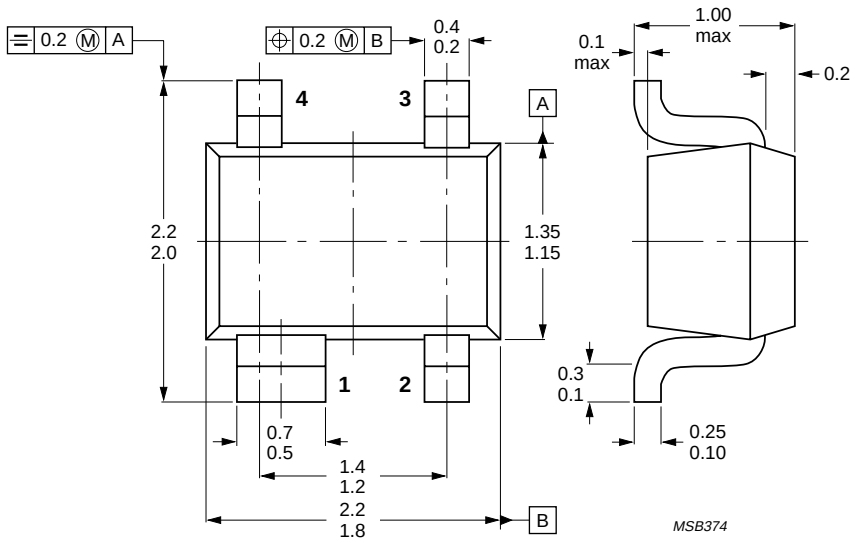


Fig.9 Definition of transistor impedance.

PACKAGE OUTLINE



Dimensions in mm.

Fig.10 SOT343.

DEFINITIONS

Data Sheet Status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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